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SAMPLING VISIT PLAN
RCRA FACILITY ASSESSMENT
CIBA-CEIGY CORPORATION
CRANSTON, RHODE ISLAND

REC'D 6-8-87

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
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1.0 INTRODUCTION

Versar Inc. received a work assignment (CDM WA No. 265) to assist U.S. Environmental Protection Agency (EPA) Region I by conducting a RCRA facility assessment (RFA) of the Ciba-Geigy Corporation chemical manufacturing plant in Cranston, Rhode Island. The objective of the RFA is to identify actual or potential releases of hazardous wastes or hazardous waste constituents that require further investigation under the RCRA corrective action program.

In May 1987, Versar completed a preliminary review (PR) of the Ciba-Geigy facility and submitted to EPA Region I a draft preliminary RFA report, under the above referenced work assignment. The report describes the facility operations and waste handling activities, identifies and evaluates the solid waste management units (SWMUs) and other areas of concern on the site, and provides recommendations for further action. After submitting the preliminary RFA report, Versar, in conjunction with EPA Region I, the Rhode Island Department of Environmental Management (RIDEM), and Ciba-Geigy representatives, conducted a visual site inspection (VSI) of the Ciba-Geigy facility in order to obtain additional site information and focus activities to be performed during the sampling visit (SV).

Versar will complete the RFA by conducting a sampling visit at the Ciba-Geigy Cranston plant. The SV will be used to fill in data gaps that remain after the PR and VSI by obtaining sampling and field data. In preparing the sampling visit work plan presented here, Versar has been guided by EPA Region I and the information collected and evaluated during the PR and VSI.

1.1 Facility Description

The Ciba-Geigy Corporation chemical manufacturing plant is located at 180 Mill Street, Cranston, Rhode Island, in a small industrial park, adjacent to residential communities of single family houses. The plant

lies in the southeast corner of Cranston approximately 4.5 miles south of downtown Providence in an unsurveyed area of the Providence quadrangle (Figure 1). The Providence quadrangle, situated in northeastern Rhode Island at the head of Narragansett Bay, is the most densely populated area in the state and serves as one of the important industrial centers of New England.

Drainage in the vicinity of the Ciba-Geigy plant flows eastward into the Providence River estuary by way of the Pawtuxet River. The Ciba-Geigy plant straddles the Pawtuxet River, which is the boundary between the cities of Cranston (Providence County) and Warwick (Kent County), Rhode Island, in this area. The entire site is within the 100-year flood plain of the Pawtuxet River, approximately 1.4 miles from the mouth of the river. The topography of the site slopes toward the Pawtuxet River.

Ciba-Geigy has 6.8 acres of land in Cranston which have been used for production, laboratory, and pilot plant facilities, and another 5.8 acres which was occupied by a biological wastewater treatment plant. Ciba-Geigy also purchased 23 acres of adjoining property from the Atlantic Tubing and Rubber Company, but this land has not been utilized. In addition to the property in Cranston, Ciba-Geigy has 27.5 acres in Warwick which have been minimally developed and utilized for cafeteria, locker room, warehouse, engineering and maintenance facilities, and hazardous waste drum storage.

All chemical manufacturing operations at the Ciba-Geigy Cranston plant ceased as of May 1986. Ciba-Geigy is currently in the process of closing the facility and dismantling the plant. Ciba-Geigy has submitted specifications for cleanup and a proposal for certification of closure to RIDEM, Division of Air and Hazardous Materials. It is the intent of Ciba-Geigy that all facilities at the Cranston plant which have been used for the storage, transfer and/or manufacturing of chemical materials be cleaned and decontaminated as required, so that upon closure, the entire facility could be used for other purposes.

FIGURE 1
GENERAL LOCATION MAP
CIBA-GEIGY CORPORATION, CRANSTON, RHODE ISLAND

From 1930 to 1949, the Alrose Chemical Company occupied part of the present plant site in Cranston now known as Ciba-Geigy. In 1949, Geigy Chemical Corporation of Ardsley, New York, purchased the land from Alrose Chemical and operated the facility as the new chemical manufacturing headquarters for all Geigy chemicals. In October 1971, Geigy Chemical merged with Ciba Corporation of Summit, New Jersey, to form Ciba-Geigy Corporation, a wholly owned American subsidiary of Ciba-Geigy Limited, headquartered in Basel, Switzerland. The Cranston plant, after the merger, was used as a pilot/start up facility designed and built for manufacturing almost any organic chemical on a batch type basis. In January 1984, Ciba-Geigy announced plans for a gradual phase out of the Cranston plant as part of an overall consolidation of Ciba-Geigy's chemical manufacturing operations. As of May 1986, Ciba-Geigy had ceased all chemical manufacturing operations at the site and begun dismantling of the facility.

The Cranston plant of Ciba-Geigy Corporation was a batch process, multi-product, fine organic chemical, and pharmaceutical manufacturing operation utilizing approximately 500 raw materials to produce nearly 150 finished products and numerous intermediate products. These products were manufactured utilizing common equipment. Typical operations included organic synthesis, crystallization, distillation, isolation by filtration, drying and grinding. Major process facilities included:

- Manufacturing Building 21/22
- Manufacturing Building 17/19
- Manufacturing Pilot Plant 16/23
- Zinc Recovery System Building 24
- Manufacturing Building 11
- Cooling Tower and Pump House, Building 27
- Waste Treatment Plant, Raw Waste Sump, and all underground pipes and sumps

The nature of organic chemical reactions run by Ciba-Geigy were such that by-products were formed naturally and more by-products were generated in the purification of the products. Of the more than 300 processes Ciba-Geigy may have been involved with to form desired products,

approximately 70 waste streams, classified as hazardous waste under RCRA (40 CFR 261), were generated. These wastes were mostly listed chlorinated and unchlorinated solvents, and unlisted ignitable solvents, as well as other chemicals.

During chemical manufacturing operations, improved solvent recovery operations and water pollution control equipment were installed to reduce the waste load in process water. Concentrated by-products and solvents were recycled and recovered where possible, while spent solvents and other wastes that could be collected in significant quantities were containerized and stored onsite for ultimate offsite disposal. On occasion, concentrated materials were neutralized or chemically reacted to reduce their degree of hazard by utilizing normal production equipment. Chemicals that appeared in the plant's process wastewater were predominantly from vacuum jets, wash vacuum pumps, and air pollution control scrubbers.

In January 1970, RIDEM issued an Order of Approval to Ciba-Geigy for the construction of a wastewater treatment plant. Construction of an onsite biological treatment system was completed in 1972. More than 1 million gallons per day of process wastewater was treated by screening, neutralization, biological oxidation, chlorination, and clarification through this system before being discharged to the Pawtuxet River.

Since 1949 when Geigy Chemical Corporation began operation at the site, there has been no disposal of any waste from chemical manufacturing on the plant site. No wastes generated offsite were accepted by the facility. All hazardous wastes generated by Ciba-Geigy and stored at the facility were regularly shipped to approved disposal areas offsite. The facility shipped over four million pounds of hazardous waste each year, most of it by 10,000-gallon railroad cars to one of Ciba-Geigy's southern facilities for incineration. Additional wastes were sent to various disposal facilities in Ohio, New Jersey, and Louisiana.

Ciba-Geigy operated its hazardous waste storage facility prior to 1982 and was allowed to continue operating under interim status until an application for a Hazardous Waste Treatment and Storage Facility permit (for storage greater than 90 days) was approved. Ciba-Geigy stored wastes onsite in 55-gallon steel drums and in a 6,000-gallon steel tank. The drum storage area had a maximum capacity of 768 fifty-five gallon drums which were used to contain various wastes including flammable solids, PCB-contaminated oils, corrosive solids, distillation sludge, chloroform, polychlorinated organics, flammable liquids, alcohol, and polyimides. The 6,000-gallon tank was used to store a solvent waste mixture comprised of varying solutions of toluene, xylene, naphthalite, acetone, monochlorobenzene, isopropanol, heptane, methanol, ethanol, and water.

As of November 1986, the drum storage area and waste solvent storage tank had been subjected to a cleaning process which resulted in the removal and disposal of all hazardous waste from these locations. Currently, most major waste or storage units and buildings have been demolished or removed from the site including bulk solvent storage tanks; buildings 10, 11, 14, 17/19, 16/23, 24; the cooling tower; and the waste treatment plant. The locations of SWMUs identified by Ciba-Geigy are still discernible, however. During the visual site inspection of the facility on May 8, 1987, no additional SWMUs were identified.

1.2 Solid Waste Management Units

Under RCRA Section 1004(28), the term "solid waste management" means the systematic administration of activities which provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of solid waste. A solid waste management unit (SWMU) is defined as any discernible waste management unit at a RCRA facility from which hazardous constituents might migrate, irrespective of whether the unit was intended for the management of solid and/or hazardous waste.

Ciba-Geigy, in response to a request for information from EPA pursuant to Section 3007 of RCRA, identified the following 11 SWMUs at the Cranston facility (Figure 2).

SWMU 1 - Hazardous Waste Storage Area (Drums)
SWMU 2 - 6,000-gallon Hazardous Waste Storage Tank
SWMU 3 - 7,500-gallon, 90-day Accumulation Tank
SWMU 4 - Trash Compactor
SWMU 5 - Former Silt Pile
SWMU 6 - Zinc Oxide Pile
SWMU 7 - Chlorosulfonic Acid Spill Area
SWMU 8 - Potassium Ferrocyanide Spill Area
SWMU 9 - Wastewater Pipeline Break (January 12, 1982)
SWMU 10 - Wastewater Pipeline Break (September 7, 1983)
SWMU 11 - Building 11 Area

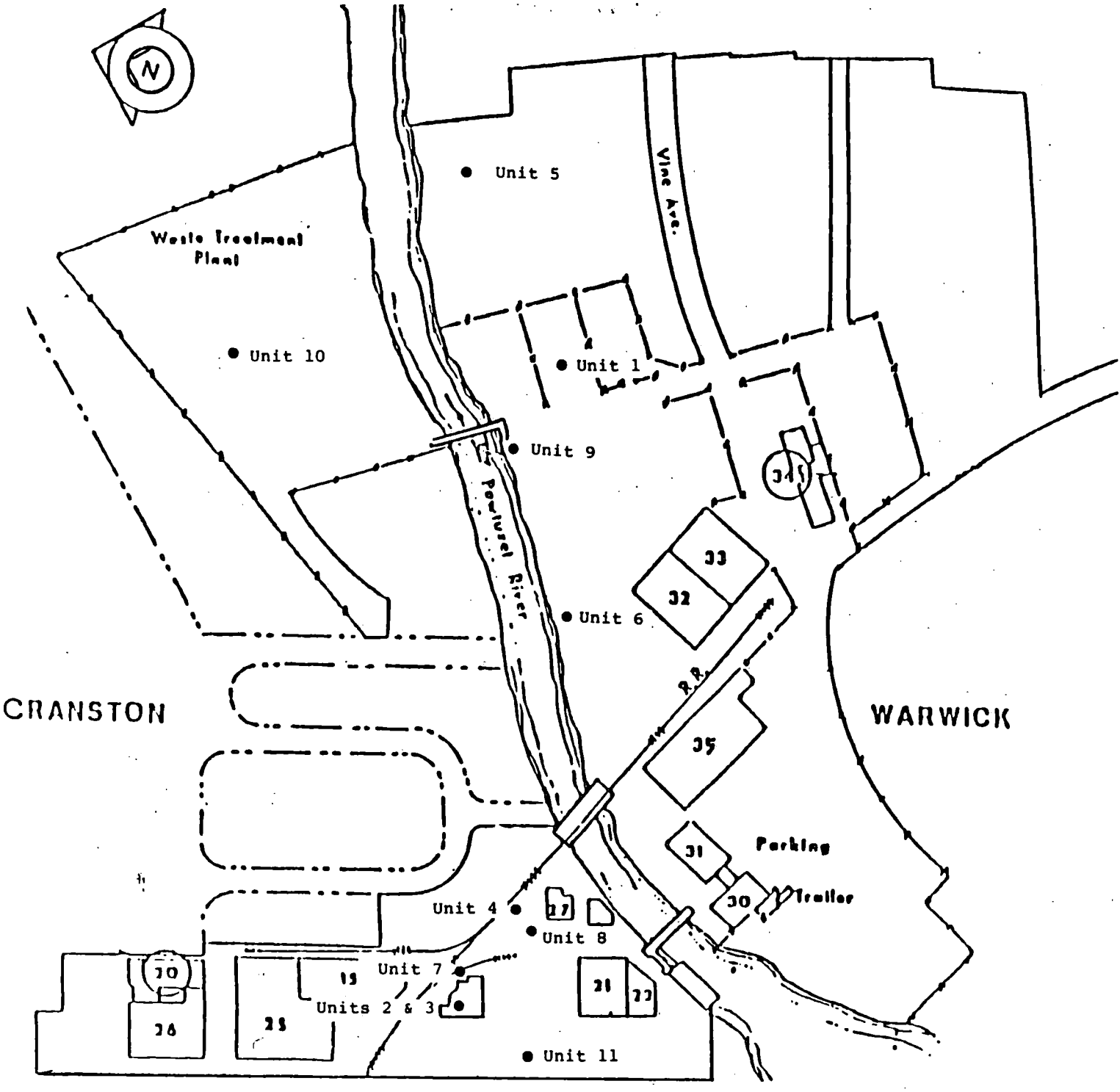

FIGURE 2
SOLID WASTE MANAGEMENT UNITS
CIBA-GEIGY CORPORATION, CRANSTON, RHODE ISLAND

2.0 SAMPLING VISIT OBJECTIVES

The sampling visit is the final step of the RFA process designed to identify releases of hazardous wastes at RCRA facilities. The SV focuses on collecting additional sampling information to fill in data gaps that remain upon completion of the preliminary review and visual site inspection. This information enables the investigator to make release determinations in the RFA. The sampling visit by Versar will involve the collection of up to 19 environmental samples, including soil, sediment, and ground-water samples for chemical analyses.

The specific objectives of the sampling visit at the Ciba-Geigy facility are as follows:

- Identify evidence of a release or releases of hazardous wastes or hazardous waste constituents to subsurface soils by collecting samples from around the main tank farm.
- Identify any residual contamination in surface soils of the former silt pile area site.
- Determine if contaminants are present in the ground water by collecting water samples from various monitoring well locations onsite.
- Identify contaminants present in the sediments of the Pawtuxet River resulting from past or current releases from the facility.
- Conduct ambient air monitoring at the SWMUs and sampling locations to primarily determine the appropriate level of personnel protection required during sampling activities and assess the potential for releases of contaminants to the air.
- Document any past or current releases, make visual observations of the facility taking photographs as necessary, and obtain any additional samples for analyses.

3.0 TECHNICAL APPROACH

3.1 Sample Locations

The proposed sampling visit and extent of sampling are based primarily upon specific guidance provided by U.S. EPA Region I and information gathered and evaluated during the preliminary review and visual site inspection. Sampling will generally be restricted to areas for which data gaps exist. Table 1 summarizes the sampling locations, procedures, and analyses to be conducted within or adjacent to these areas. Sample locations and numbers designated in Table 1 are shown in Figure 3. A total of 19 environmental samples, including QA/QC samples will be collected.

3.1.1 SWMU 1 - Hazardous Waste Storage Area (Drums)

During the sampling visit, no samples are expected to be collected from this SWMU. The hazardous waste storage area was designed for a maximum capacity of 768 fifty-five gallon drums and is located on the Warwick side of the Ciba-Geigy facility. It is an asphalt-lined area enclosed by a 12-inch high, 8-inch wide concrete containment barrier. The area was operated from 1981 to 1986 solely for the storage of hazardous waste. All drums from the SWMU have been removed and the entire area cleaned. No evidence of release from the SWMU to the environment which warrants further investigation has been documented.

3.1.2 SWMU 2 - 6,000-Gallon Hazardous Waste Storage Tank

SWMU 2 is located in the main tank farm on the Cranston side of the Ciba-Geigy facility. The 6,000-gallon carbon steel tank was used solely for the storage of hazardous waste from 1981 to 1986. The tank was located in a concrete-lined enclosure and was used to store a bulk solvent mixture of varying amounts of toluene, monochlorobenzene, xylene, naphthalite, acetone, isopropanol, heptane, methanol, ethanol, and water. The contents from this tank were regularly pumped into 10,000-gallon railroad cars for offsite disposal.

TABLE 1

SAMPLE LOCATIONS AND PROCEDURES CIBA-GEIGY CORPORATION, CRANSTON, RHODE ISLAND

Sample Location	Number of Samples	Sample Matrix	Collection Procedure	Sample Container	CLP[a] Analytical Parameter
Main Tank Farm:					
SS-1, SS-2	2	Subsurface soil, grab	Hand auger	2x120 ml wide-mouth glass vials	VOA[b]
				1x8 oz. wide-mouth glass jar	B/N/A[c]
SS-1A	1	Subsurface soil, duplicate	Hand auger	2x120 ml wide-mouth glass vials	VOA
				1x8 oz. wide-mouth glass jar	B/N/A
Silt Pile:					
SS-3	1	Surface soil, composite	Hand trowel	2x8 oz. wide-mouth glass jars	HSL[d]
				2x120 ml wide-mouth glass vials	
Monitoring Pipes:					
GW-1, GW-2, GW-3, GW-4, GW-5	5	Ground water, grab	Teflon bailer	4x1 liter glass amber jars	HSL
				1x1 liter polyethylene bottle	
				2x40 ml glass vials	
GW-1A	1	Ground water, duplicate	Teflon bailer	4x1 liter glass amber jars	HSL
				1x1 liter polyethylene bottle	
				2x40 ml glass vials	
GW-6, GW-7, GW-8	3	Ground water, grab	Teflon bailer	4x1 liter glass amber jars	VOA, B/N/A, metals
				1x1 liter polyethylene bottle	
				2x40 ml glass vials	
EB-1	1	Equipment blank	-	4x1 liter glass amber jars	HSL
				1x1 liter polyethylene bottle	
				2x40 ml glass vials	
Pawtuxet River:					
SD-1, SD-4	2	Sediment, grab	Sediment sampler	2x8 oz. wide-mouth glass jars	HSL, Dioxin/Furan[e]
				1x4 oz. wide-mouth glass jar	
				2x120 ml wide-mouth glass vials	
SD-2, SD-3	2	Sediment, grab	Sediment sampler	2x8 oz. wide-mouth glass jars	HSL
				2x120 ml wide-mouth glass vials	
Background:					
BG-1	1	Surface soil, composite	Hand trowel	2x8 oz. wide-mouth glass jars	HSL
				2x120 ml wide-mouth glass vials	

[a] = Contract Laboratory Program.
[b] = Volatile Organic Analysis.
[c] = Base/Neutral/Acid Extractable Organic Analysis.
[d] = Hazardous Substance List VOA, B/N/A, Pesticides/PCB, and Total Metals Analyses.
[e] = Special Analytical Services 2,3,7,8-TCDD and 2,3,7,8-TCDF analyses.

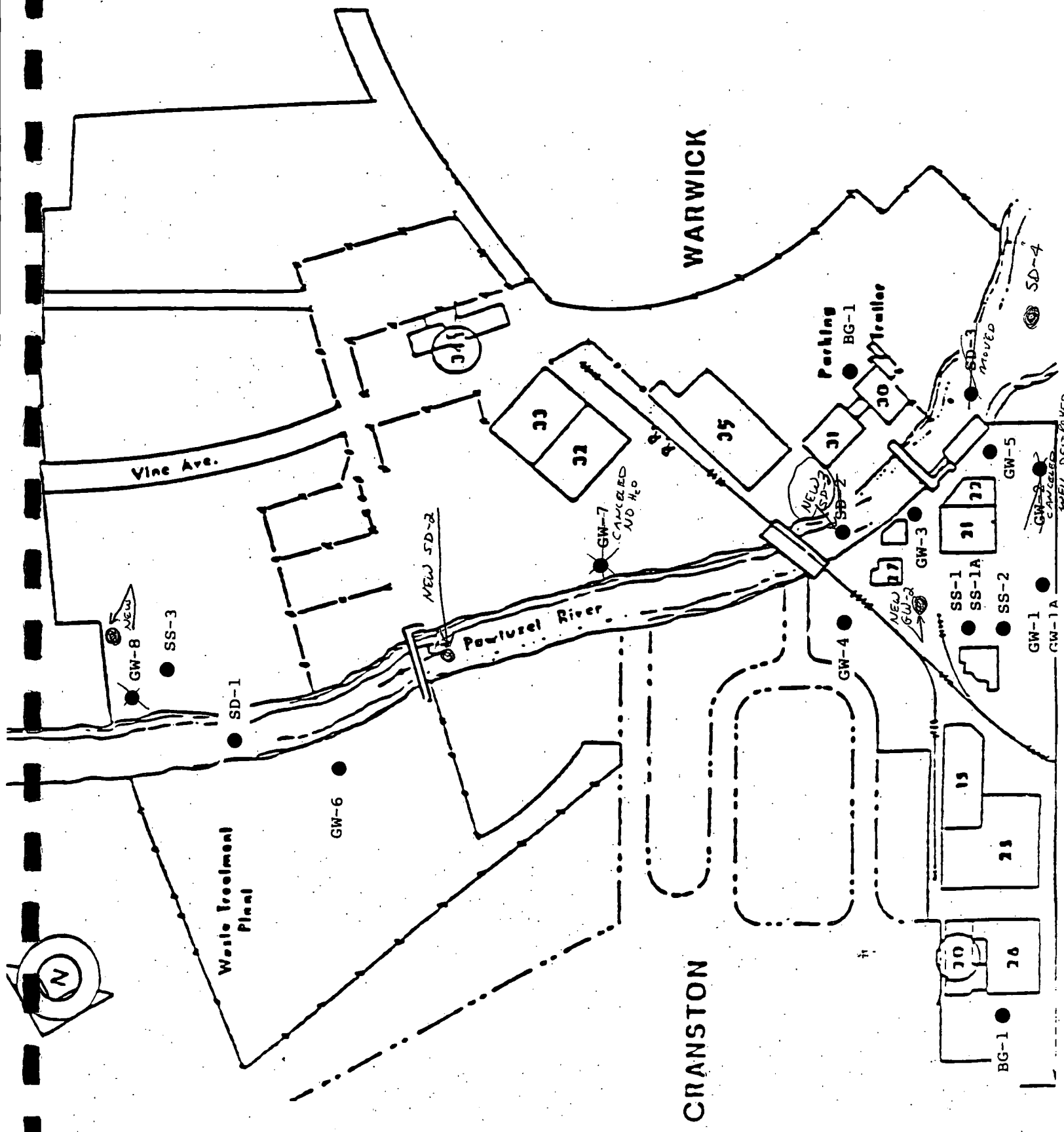

FIGURE 3
SAMPLING LOCATIONS
CIBA-GEIGY CORPORATION, CRANSTON, RHODE ISLAND

During transfer operations and storage of the waste solvent, no reported releases have been documented from this SWMU. However, air monitoring of a sewer manhole adjacent to and downgradient of the main tank farm revealed the presence of organic vapors. Subsurface migration through soils to the ground water is the most likely pathway for residual contaminants from this area. The water table generally lies about 6 feet below the ground surface.

Three subsurface soil samples (including one duplicate sample) will be collected downgradient of the main tank farm. The samples will be used to identify any releases from this area, characterize any residual organic contamination present, and possibly identify potential source areas for ground-water contamination. These samples will be analyzed for volatile and semivolatile organics. In addition to SWMU 2, the main tank farm includes SWMU 3, a 7,500-gallon 90-day accumulation tank and several other raw material, bulk solvent storage tanks which may have contributed to releases in the area.

3.1.3 SWMU 3 - 7,500-Gallon 90-Day Accumulation Tank

The 90-day accumulation tank was located in the main tank farm along with SWMU 2 and was enclosed (along with three other tanks) by concrete containment walls. The tank was used to store waste flammable liquids from 1985 to 1986 for a period of less than 90-days at a time. The contents from the tank were regularly pumped into 10,000-gallon railroad cars together with wastes from SWMU 2. During transfer operations and storage of the flammable liquids, no reported releases have been documented from this SWMU.

3.1.4 SWMU 4 - Trash Compactor

During the sampling visit, no samples are expected to be collected from this SWMU. The trash compactor was located north of the cooling tower (building 27) and was situated on a concrete base. Cardboard, packaging material, washed fiber drums, filters, and waste paper were disposed of in this compactor from 1972 to 1986. The former trash

compactor area was concrete-lined and drainage from the compactor flowed to the facility's industrial waste treatment plant.

3.1.5 SWMU 5 - Former Silt Pile

In 1971 a waste pile of silt dredged from the Pawtuxet River, upstream of Ciba-Geigy, was landfilled on the Warwick side of the facility. Approximately 6,630 cubic yards of this material was dredged from the river bottom, piled in the far northeast corner of the Warwick property adjacent to the river, and allowed to dewater for a number of years. In 1976 this pile was removed from the site.

No analytical data regarding waste characterization of the silt pile exists. There is a potential for organic and inorganic pollutants from various upstream dischargers to accumulate in the sediments of the river. The former silt pile therefore could have contained hazardous constituent, and may have subsequently contributed to a release from Ciba-Geigy. Readings above background using a TIP (total ionizables present) photoionization unit were detected from disturbed soils in the area during a site inspection on May 8, 1987, indicating the possible presence of organic contaminants. One composite surface soil sample will be collected from the former silt pile area to identify any residual contamination which may be present. The composite sample will consist of material from at least two sampling locations. The sample will be analyzed for volatile organics, semivolatile organics, pesticides/PCB and total metals.

3.1.6 SWMU 6 - Zinc Oxide Pile

During the sampling visit, no samples are expected to be collected from this SWMU. A pile of soil containing zinc oxide residues from a broken railcar was placed, in the late 1960s, north of building 32 on Warwick property near a guardrail which borders the Pawtuxet River. The majority of the pile presently remains on site. Zinc oxide is not a RCRA-regulated waste and any release from this pile is not expected to pose a threat to human health or the environment.

3.1.7 SWMU 7 - Chlorosulfonic Acid Spill Area

During the sampling visit, no samples are expected to be collected from this SWMU. A 500-gallon chlorosulfonic acid spill from a trailer truck occurred in 1961 and is estimated to have covered an area 10 feet by 20 feet by 1 foot deep along the northeast portion of the present main tank farm. The area covered by the spill was reportedly neutralized and subsequently excavated for the tank farm foundations. Evidence of release has not been documented since most of the spill area is now covered by the tank farm.

3.1.8 SWMU 8 - Potassium Ferrocyanide Spill Area

During the sampling visit, no samples are expected to be collected from the SWMU. Blue stained soil, resulting from a spill of an unknown quantity of potassium ferrocyanide (Prussian blue) which occurred around 1956, and was excavated for new tank farm foundations in 1961. At least 306 cubic yards of soil were removed and new fill compacted in place for the storage tank foundations. During the installation of the plant wastewater piping system in the 1960's, another quantity of blue stained soil was excavated from an area northwest of the building 27. Evidence of release has not been documented since the areas are presently covered by the tank farm and concrete pavement.

3.1.9 SWMU 9 - Wastewater Pipeline Break (January 12, 1982)

During the sampling visit, no samples are expected to be collected from this SWMU. SWMU was a part of the Ciba-Geigy wastewater treatment process. On January 12, 1982, a break in the main raw waste transfer line on the southerly side (Warwick property) of a pipe bridge to the wastewater treatment plant resulted in the discharge of concentrated process wastewater (24,000-gallons) to the Pawtuxet River. During the site inspection of the facility, no visual evidence of release surrounding the spill area was found.

3.1.10 SWMU 10 - Wastewater Pipeline Break (September 7, 1983)

During the sampling visit, no samples are expected to be collected from this SWMU. SWMU 10 was also a part of the Ciba-Geigy wastewater treatment process. On September 7, 1983 a rupture in an underground line feeding two of the three equalization tanks resulted in a loss of approximately 50,000 gallons of pretreated wastewater to the Pawtuxet River. Cavitation of soils around the ruptured pipeline which was located about 5 feet below the ground surface allowed the discharge to flow to the surface before entering the river. All structures and facilities at the wastewater treatment plant have been demolished and removed. Soils throughout the plant have been excavated, backfilled and graded. During the site inspection of the plant no visual evidence of release within the vicinity of the spill was found.

3.1.11 SWMU 11 - Building 11 Area

SWMU 11 is the site of the former production building 11 which was razed in October 1983. Analyses of ground-water samples in the vicinity of the building 11 sump at the time of demolition indicated a low level (<1 ppm) presence of toluene. Toluene was a major organic solvent used in Ciba-Geigy's chemical manufacturing processes. The presence of toluene in the ground water indicates a potential release to the environment which may not be specific to this one area of the site.

The area of the former building 11 is now paved. Access to ground water in the former production area is limited to recently installed piezometers, which are nonpumping wells used for ground-water level measurements. Air monitoring of the vapor space within these pipes using the TIP photoionization unit revealed the presence of organic vapors above background at all locations within the former production area. One ground-water sample will be collected from the pipe adjacent to the building 11 area to determine the presence of contaminants in the ground water. Other ground-water locations will be sampled as discussed in the following section.

3.1.12 Ground-Water Level Measurement Pipes

In April 1987, several piezometers (ground-water level measurement pipes) were installed at various locations throughout the Ciba-Geigy facility. These pipes were not installed specifically for sampling purposes and are not classified as monitoring wells. They are constructed of 1 1/4-inch diameter, galvanized steel piping, and are apparently screened at the bottom within the zone of saturation with a total depth of at least 6 to 8 feet below ground surface.

During the visual site inspection, the vapor space in nine of these pipes located on both the Cranston and Warwick sides of the facility was monitored for the presence of organic vapors. In every case, readings were recorded above background levels indicating the possible presence of organic contaminants in the subsurface. The highest readings were obtained from the former production area in Cranston.

Up to eight ground-water samples will be collected from these ground-water points in order to determine the presence of contaminants in the ground water and identify potential source areas for the contamination which may require further investigation. Ground-water samples will be analyzed for volatile organics, semivolatile organics, and total metals. Samples collected from the former production area will also be analyzed for pesticides/PCBs.

3.1.13 Pawtuxet River

The Pawtuxet River which divides the Ciba-Geigy facility and serves as the boundary between the cities of Cranston and Warwick in this area is probably the most sensitive environmental area with respect to release from the site. Discharges to the river were monitored under a National Pollutant Discharge Elimination System (NPDES) permit at four outfall stations, two located on the northern bank of the river and two on the southern bank. Prior to construction of the facility's wastewater treatment plant, process wastewaters were reportedly discharged directly into the river upstream of the facility. The location of this former

discharge point is currently unknown. Additionally, other routine or uncontrolled releases have occurred to the river throughout the operating life of the plant and ground water which may be contaminated below the facility contributes to the flow of the Pawtuxet River.

Studies have shown that organic pollutants derived from industrial and wastewater discharges into the Pawtuxet River are also found in its underlying sediments (Quinn et al., 1985). Some compounds that were produced by Ciba-Geigy tend to accumulate in the sediments and have been found in Narragansett Bay sediments. The Pawtuxet River is about 80-feet wide as it passes the plant and flow may be expected to exceed 41 million gallons per day. Evidence of release from Ciba-Geigy will more than likely be found in the river sediments.

Four sediment samples will be collected from the Pawtuxet River to identify any contaminants present. These locations include (1) a sample near outfall 001, the wastewater treatment plant discharge point, (2) a sample near the former production area and outfall 002, the cooling tower noncontact water discharge point, (3) a sample near the original outfall used for discharge of process wastewater before construction of the treatment plant, and (4) a sample further upstream of the facility to serve as a background sample for certain compounds attributable to Ciba-Geigy. These samples will be analyzed for volatile organics, semivolatile organics, pesticides/PCBs, and total metals. The two samples furthest downstream and upstream will also be analyzed for tetrachlorinated dibenzo-p-dioxin and tetrachlorinated dibenzofuran.

3.2 Sample Collection Procedures

All samples will be collected with EPA-approved sampling devices and procedures. In general, samples will be analyzed by following EPA-approved test methods for evaluating solid waste (EPA, 1984a), and chemical analysis of water and wastes (EPA, 1983). Sample volumes required by analytical procedures and quality control specifications will follow the levels outlined by the EPA Contract Laboratory Program (CLP) (EPA, 1986).

3.2.1 Soil Samples

A total of two surface soil and three subsurface soil samples (including one duplicate and one background sample) will be collected during the sampling visit. Surface soil samples will be composited while all subsurface soil samples will be grab-type samples. The exact location of all soil samples will be determined in the field at each predetermined location. These locations will be accurately documented in a bound field logbook.

Surface soil samples will be collected from a depth of 1-3 inches and composited from at least two sampling locations. Organic samples, except for VOA samples, will be placed on an aluminum foil-lined tray by using a stainless steel scoop or hand trowel. Once enough sample has been obtained, it will be mixed and transferred into one (or more) precleaned, 8-ounce, wide-mouth glass jars with Teflon-lined lids by using the same scoop or trowel used to collect the sample. VOA soil samples will not be drawn from composited samples but will be collected directly into two 120-milliliter glass vials with Teflon-lined lids, leaving minimum headspace, using stainless steel scoops from each location.

Metal surface soil samples will be placed on a plastic tray or in a polyethylene bag by using a plastic scoop. Once enough sample has been obtained, it will be mixed and transferred into one (or more) precleaned, 8-ounce, wide-mouth glass jars with Teflon-lined lids by using the sample scoop used to collect the sample.

A precleaned hand auger or coring device will be used to obtain the subsurface soil samples. The depth of the samples will be determined in the field in order to provide an adequate representation of any contamination in the area. The exact depths from which subsurface soil samples are collected will be recorded according to standard operating procedures in a bound field logbook. Soil from the hand auger or coring device will be removed using a stainless steel spoon and placed on an

aluminum foil-lined tray for organic samples, except for VOA samples. Once enough sample material has been obtained, it will be uniformly mixed and transferred into a precleaned, 8-ounce, glass jar with a Teflon-lined lid, using the same spoon used to remove the sample. Subsurface VOA soil samples will be collected directly from the hand auger or coring device using a stainless steel spoon into two 120-milliliter glass vials with Teflon-lined lids. Subsurface soil samples will not be collected for metal analyses.

3.2.2 Sediment Samples

A total of four sediment samples will be collected from the bottom of the Pawtuxet River at the Ciba-Geigy facility. The exact location of all sediment samples will be determined in the field at each predetermined location and recorded in a bound field logbook. All samples will be grab type samples taken from a depth of 1-6 inches using an Ekman dredge for locations in the middle of the river. Once enough sample material has been obtained from the river bottom, sample collection procedures will be identical to the collection procedures outlined for soil samples. Sample containers will include precleaned, 8-ounce glass jars with Teflon-lined lids for semi- volatile organic, pesticide/PCBs, and metals analysis; 4-ounce glass jars with Teflon-lined lids for dioxin and furan analyses; and 120-milliliter glass vials with Teflon-lined lids for volatile organic analyses.

Two of the four sediment samples will be analyzed for 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (TCDD) and 2,3,7,8-tetrachlorinated dibenzofuran (TCDF) based on the recommendation of Dr. James Lake with the U.S. EPA Environmental Research Laboratory in Narragansett, Rhode Island. His studies show that dioxin precursors, chlorinated dibenzofurans and chlorinated diphenyl ethers, present in samples of marine organisms and suspended particulate matter obtained from Narragansett Bay may be a result of chemical plant discharges in the upper bay. One sediment sample downstream of the facility near the wastewater treatment

plant outfall will be analyzed for 2,3,7,8-TCDD and 2,3,7,8-TCDF to determine if Ciba-Geigy is a potential source based on any dioxin and/or furan present in an upstream sediment sample. Downstream samples will be collected first, proceeding upstream.

3.2.3 Ground-Water Samples

Ten ground-water samples (including one duplicate and one equipment blank) will be collected from the ground-water level measurement pipes recently installed at the Ciba-Geigy facility. Ground-water sampling will proceed from the expected least contaminated ground-water point to the most contaminated point. All pipes will be opened from an upwind location. Ambient air levels will be taken at the pipe opening immediately upon uncapping the pipe and at the breathing zone after the pipe has been allowed to vent for at least ten minutes.

Depth-to-ground water and total depth measurements will then be taken. Three casing volumes of water will be purged from each pipe using a dedicated Teflon bailer prior to sample collection. The casing volume of water is determined from the inside diameter of the pipe and the depth of water in the pipe. When bailers are used to purge, the actual volume of each bailer's contents is measured using a calibrated bucket. Purged ground water will be discharged directly on the ground surface, downslope of the pipe, or containerized and disposed of onsite in appropriate waste disposal units if requested by the facility or EPA.

After a pipe has been purged and allowed to stabilize, a grab type sample will be collected (in order of sample collection) in two 40-milliliter glass vials for volatile organics analysis (VOA), four 1-liter amber glass jars for semivolatile and pesticides/PCB analyses, and one 1-liter polyethylene bottle for total metal analyses, utilizing the same dedicated bailer fitted with a bottom emptying device. Samples collected for total metal analyses will be preserved with nitric acid to pH < 2.

Water will be removed from the pipe as needed to fill the sample containers, transferring equal volumes from the bailer into each container. Any excess water generated during sample collection will be discharged directly to the ground downslope of the pipe location. After a sample has been collected, the pipe will be recapped to preserve its integrity.

3.2.4 Ambient Air Monitoring

Versar will monitor organic vapors during the sampling visit by using a photoionization analyzer. Instantaneous or continuous readings, or both, will be taken during the field evaluation of each SWMU or sampling location in order to detect the presence of photoionizable constituents in ambient air. The following general procedures will be followed for air monitoring:

- Manufacturer's recommended procedures will be used to operate the instruments.
- The analyzers will be calibrated (Versar Inc., 1986) prior to the site visit, and batteries will be checked daily to ensure accurate readings.
- Ambient air measurements will be taken at locations upwind and downwind of the unit being sampled, taking into account air currents and drafts in the vicinity. Measurements will be taken near the ground surface as well as in the breathing zone.
- Background and detectable levels taken throughout each of the SWMUs will be recorded in a field notebook.

3.3 Analytical Requirements

Sample analyses will be performed in accordance with procedures specified under the EPA Contract Laboratory Program (CLP). Versar will work with U.S. EPA Region I and the Sample Management Office as needed in assigning and scheduling the contract laboratory or laboratories that will receive the environmental samples collected from Ciba-Geigy. Routine analytical services (RAS) will be required for the environmental samples collected for hazardous substance list (HSL) volatile organic,

semivolatile (base/neutral/acid extractable) organic, pesticides/PCB, and total metals (as outlined in Table 1) according to the CLP organic and inorganic analyses statement of work (EPA, 1985; EPA, 1984b).

Special analytical services (SAS) will be required for the environmental samples collected for dioxin and furan analyses (as outlined in Table 1). This special requirement will provide analyses for 2,3,7,8-TCDD and 2,3,7,8-TCDF in the sediment samples with a targeted detection limit of 100 parts per trillion. The identification and quantification of dioxin and furan in soil/sediment samples is performed utilizing EPA-developed selected ion monitoring (SIM) GC/MS instrumentation and data systems.

3.4 Sample Compositing and Splitting

At sites where multiple sample aliquots are to be composited into a single sample, each aliquot will be volumetrically measured to ensure proper proportioning. The aliquots will then be placed on a foil-lined tray and mixed with a dedicated spatula or trowel. Samples for VOA will not be drawn from a composite sample. If the total volume of composited material exceeds that needed for analysis, the volume will be reduced by the cone and quarter method.

The cone and quarter method entails collecting the composite sample aliquots on an aluminum foil-lined tray and forming the sample material into a cone. The cone is then divided into quarters. Two diagonal quarters are separated from the cone and mixed with a spatula or trowel composed of inert material. This procedure is repeated until the appropriate volume of sample material is retained. Finally, the composited material is introduced into sample containers.

3.5 Containerization, Labeling, and Preservation

Once the samples have been collected, composited, and reduced to the optimum volume for analysis, they will be placed in appropriate containers as indicated in Table 1. Each container (1) will be labeled with a

unique sample identification number, and (2) will possess a sample tag identifying the sample location, date, time, and analyses to be performed. In addition, each sample will be thoroughly documented by a traffic report which provides a further description of the sample and special handling instructions. Dioxin and furan samples will be documented on a SAS packing list which provides further sample description. Examples of a sample tag, an organics traffic report form, an inorganics traffic report form, and an SAS packing list are presented as Figures 4, 5, 6, and 7, respectively. Organic and inorganic samples taken from the same sampling location will be matched on both traffic reports.

All low level soil and sediment samples will be preserved by placing sample containers on ice in a cooler after collection. Sediment samples collected for dioxin and furan analyses will not be cooled for shipment per CLP protocol (EPA, 1986). Water samples for organics analysis will be preserved by placing sample containers on ice in a cooler immediately after collection. Inorganic water samples requiring chemical preservation will be placed on ice after preservative has been added to ensure uniform sample handling procedures.

3.6 Chain of Custody and Sample Transport

A standard chain of custody will be maintained as samples are generated. Samples will be retained at all times in the field crew's custody. The samples will be kept on ice and protected from direct sunlight. Samples will be transported by an overnight courier service to the designated CLP analytical laboratory daily, or as needed for soil/sediment samples.

All samples suspected to contain 2,3,7,8-TCDD and/or 2,3,7,8-TCDF will be considered medium hazard samples and handled accordingly. Each dioxin/furan sample will be enclosed and sealed in a metal paint can for shipment.

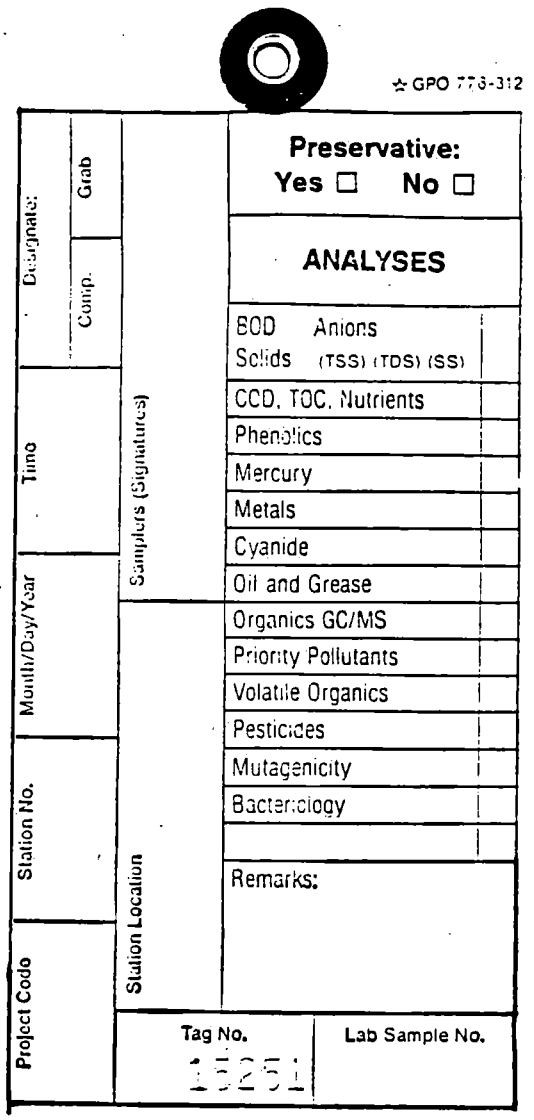

FIGURE 4
SAMPLE TAG

U.S. ENVIRONMENTAL PROTECTION AGENCY · HWI Sample Management Office

ORGANICS TRAFFIC REPORT

Sample Number Q 0984

① **Case Number:** _____

Sample Site Name/Code: _____

② **SAMPLE CONCENTRATION** (Check One)

___ Low Concentration
___ Medium Concentration

③ **SAMPLE MATRIX** (Check One)

___ Water
___ Soil/Sediment

④ **Ship To:**

Attn:

Transfer Ship To:

⑤ **Regional Office:** _____

Sampling Personnel:

(Name)

(Phone)

Sampling Date:

(Begin) (End)

⑥ **For each sample collected specify numbe of containers used and mark volume level on each bottle.**

	Number of Containers	Approxima Total Volun
Water (Extractable)		
Water (VOA)		
Soil/Sediment (Extractable)		
Soil/Sediment (VOA)		
Other		

⑦ **Shipping Information**

Name of Carrier

Date Shipped:

Airbill Number:

⑧ **Sample Description**

___ Surface Water ___ Mixed Media
___ Ground Water ___ Solids
___ Leachate ___ Other (specify) _____

⑨ **Sample L**

Q 0984 - **Water (Extractable)**
Q 0984 - **Water (Extractable)**
Q 0984 - **Water (Extractable)**
Q 0984 - **Water (Extractable)**
Q 0984 - **Water (VOA)**
Q 0984 - **Water (VOA)**
Q 0984 - **Soil/Sediment (Extractable)**
Q 0984 - **Soil/Sediment (Extractable)**
Q 0984 - **Soil/Sediment (VOA)**
Q 0984 - **Soil/Sediment (VOA)**

⑩ **Special Handling Instructions:**
(e.g., safety precautions, hazardous nature)

SMO COPY

FIGURE 5
ORGANICS TRAFFIC REPORT

U.S. ENVIRONMENTAL PROTECTION AGENCY HWI Sample Management Office

P.O. Box 818, Alexandria, VA 22313 - 703 557 2490 - FTS 557-2490

INORGANICS TRAFFIC REPORT

Sample Number **MQ 0999**

(1) **Case Number:** _____

Sample Site Name/Code:

_____

_____

_____

(2) **SAMPLE CONCENTRATION**

(Check One)

_____ Low Concentration

_____ Medium Concentration

(3) **SAMPLE MATRIX**

(Check One)

_____ Water

_____ Soil/Sediment

(4) **Ship To:**

Attn: _____

Transfer Ship To:

(5) **Sampling Office:** _____

Sampling Personnel:

(Name) _____

(Phone) _____

Sampling Date:

(Begin) _____ (End) _____

(6) **Shipping Information:**

Name Of Carrier:

_____

Date Shipped: _____

Airbill Number: _____

(7) **Sample Description:**

(Check One)

_____ Surface Water

_____ Ground Water

_____ Leachate

_____ Mixed Media

_____ Solids

_____ Other _____

(specify)

MATCHES ORGANIC SAMPLE NO. _____

(8) **Mark Volume Level On Sample Bottle**

Check Analysis required

__ Total Metals

__ Cyanide

MQ 0999 - **Total Metals**

MQ 0999 - **Total Metals**

MQ 0999 - **Cyanide**

MQ 0999 - **Cyanide**

MQ 0999

MQ 0999

MQ 0999

SMO COPY

FIGURE 6
INORGANICS TRAFFIC REPORT

U.S. ENVIRONMENTAL PROTECTION AGENCY
CLP Sample Management Office
P.O. Box 818 - Alexandria, Virginia 22313
Phone: 703/557-2490 - FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICE

PACKING LIST

Sampling Office:	Sampling Date(s):	Ship To:	For Lab Use Only
Sampling Contact:	Date Shipped:		Date Samples Rec'd:
(name)	Site Name/Code:		Received By:
(phone)		Attn:	

	Sample Numbers	Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

FIGURE 7
SAS PACKING LIST

4.0 QUALITY ASSURANCE/QUALITY CONTROL

Sampling methods detailed in this sampling plan will be strictly adhered to; deviations from or additions to this plan will be carefully documented in a bound field notebook. All field observations, field-generated forms, and labels will be entered into or attached to the notebook. Photographs, if permitted, will be logged in the notebook and labeled when they are returned from the developing laboratory.

4.1 Field Decontamination

When equipment is to be reused, it will be field decontaminated according to Versar's "Minimum Standards of Performance Manual" (Versar Inc., 1986) as summarized below:

1. Brush off loose dirt with a soft bristle brush or cloth.
2. Rinse thoroughly with tap water.
3. Wash with nonphosphate detergent in warm water.
4. Rinse thoroughly with tap water.
5. Rinse with pesticide grade hexane (spent hexane will be collected for proper disposal).
6. Rinse thoroughly with deionized water.
7. Air dry in dust-free environment.
8. Store in plastic bags.

4.2 QA/QC Samples

One duplicate subsurface soil sample and one duplicate ground-water sample will be collected during the SV at the Ciba-Geigy facility. These samples will be collected to enable duplicate analyses for each sample matrix and analytical parameter listed in Table 1, except HSL pesticides/PCB, and metals for soil/sediment samples. These duplicate analyses will help provide a measure of laboratory precision. The sample

volumes collected for dioxin sediment samples are sufficient for duplicate analysis by the contract laboratory.

One equipment blank will be collected as a control for possible contaminants introduced during ground-water sampling activities. The equipment blank is prepared at the site and subsequently handled like a sample.

One background soil sample will be obtained at the facility to provide an indication of background contaminant (VOA, semivolatile, pesticides/PCB and metals) levels onsite. Upgradient river sediment samples and ground-water samples outside of the production area will provide similar information regarding background dioxin/furan and HSL compound concentrations, respectively.

4.3 Sample Documentation

Immediately upon collecting a sample, the SV team will complete all labeling and the chain-of-custody record. This includes affixing to each sample container a unique sample number and a sample tag describing the sample location and analysis to be performed. Subsequent documentation includes completing a traffic report for each sample collected. In addition, all field observations will be recorded in a bound field notebook.

4.4 Chain of Custody

Once a sample is collected, containerized, preserved, and labeled, the sampling team will enter the appropriate information on a standard field chain-of-custody record (Figure 8). This custody record will (1) provide the information necessary to cross-refer the sample number to the specific sampling location, (2) provide the date and time of collection, and (3) document sample possession.

Versar INC.

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME					PARAMETERS									INDUSTRIAL HYGIENE SAMPLE	Y / N
SAMPLERS: *(Signature)*					(Printed)											
FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS									REMARKS	

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
(Printed)		(Printed)	(Printed)		(Printed)

Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks
(Printed)		(Printed)		

Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

FIGURE 8
STANDARD CHAIN-OF-CUSTODY RECORD

5.0 HEALTH AND SAFETY CONSIDERATIONS

To ensure the safety of all field personnel, a Versar Health and Safety Plan has been completed as part of the sampling plan and is included in Appendix A. All field personnel will thoroughly review and understand each component of the Health and Safety Plan and complete sections on emergency procedures prior to any sampling activities.

All personnel will be enrolled in an active medical surveillance program and will have received a complete annual physical examination within the past one year. All personnel will be authorized to use respiratory protection before any onsite work. The level of protection will be determined through ambient air monitoring using an organic vapor analyzer or a photoionization analyzer. The standard Versar criteria that are used to assign the appropriate level of protection are summarized below:

Level D	<5 ppm above offsite ambient and nuisance odors
Level C	5 ppm above offsite ambient
Level B	5 ppm to 20 ppm
Leave Site	>20 ppm

All measurements will be taken at the breathing zone.

While working around waste materials, the immediate hazard is skin contact. Coveralls or Tyvek suits should be worn for general dermal protection. Gloves (nitrile or better) should be worn during sample collection and handling. Standard minimum protection gear of steel-toe boots, a hard hat, and safety glasses are required.

Sampling personnel will be equipped with safety belts (MSA code orange or yellow) equipped with safety lines whenever collecting samples at the edges of lagoons or rivers.

No eating, drinking, or smoking will be allowed onsite except in facility designated areas and after proper decontamination.

These standards will be considered as minimum. All Ciba-Geigy plant requirements that are applicable to facility personnel will be adhered to, and will supersede Versar standards if they are more stringent.

REFERENCES

Quinn, James G., Eva J. Hoffman, James S. Latimer, Constance G. Carey. 1985. A Study of the Water Qualityof the Pawtuxet River, Chemical Monitoring and Computer Modeling of Pollutants. Volume 1: Chemical Monitoring of Pollutants in the Pawtuxet River. June 1985.

U.S. Environmental Protection Agency (EPA). 1986. User's Guide to the Contract Laboratory Program. Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency (EPA). 1985. July 1985 Revision. Statement of Work for Inorganic Analysis - Multi-media, Multi-concentration. U.S. EPA Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency (EPA). 1984a. Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, Second Edition, Revised. Office of Solid Waste, U.S. Environmental Protection Agency, Washington, DC.

U.S. Environmental Protection Agency (EPA). 1984b. Statement of Work for Inorganic Analysis - Multi-media, Multi-concentration. U.S. EPA Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency (EPA). 1983. Methods for Chemical Analyses of Water and Wastes. No. 600/4-79-020. U.S. EPA, Office of Research and Development, Cincinnati, OH.

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APPENDIX A

PRELIMINARY HEALTH AND SAFETY PLAN

SITE HEALTH AND SAFETY PLAN FORM
TES III Health and Safety Program

This document is for exclusive use of the USEPA, TES III Team Firms, and their subcontractors.

CAMP DRESSER & McKEE INC.

SITE NAME Ciba-Geigy Corporation SITE # _____ LOCATION Cranston, Rhode Island REGION I

PREPARED BY Dennis P. Giustra DATE 5/27/87 DOCUMENT # 2071Y

FIRM Versar Inc. WORK ASSIGNMENT # 265

EPA CONTACT Frank Battaglia EPA CONTACT PHONE # 617-223-1961

( ) AMENDMENT TO EXISTING APPROVED HSP ( ) DATE EXISTING APPROVED HSP _____

OBJECTIVES: Summarize below.

Conduct a sampling visit (SV) of the Ciba-Geigy facility, with EPA Region I, as part of a RCRA facility assessment under the RCRA Corrective Action Program. The SV will entail the collection of 19 surface soil, subsurface soil, ground-water, and river sediment samples at various locations throughout the facility as outlined in the SV work plan.

SITE TYPE: Check as many as applicable

Active	( )	Landfill	( )	Unknown	( )
Inactive	(X)	Uncontrolled	( )	Other, specify:	
Secure	(X)	Industrial	(X)		
Unsecure	( )	Recovery	( )		
Enclosed space	( )	Well Field	( )		

SITE DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dikes, power line, terrain, etc.)

The Ciba-Geigy, Cranston, Rhode Island, chemical manufacturing plant is located at 180 Mill Street in a small industrial park area adjacent to (on several sides) residential neighborhoods. The plant straddles the Pawtuxet River which is the boundary between the cities of Cranston and Warwick in this area. The plant lies approximately 1.4 miles west of the Providence River, the tidal estuary of the Pawtuxet River. Ciba-Geigy utilized approximately 13 acres in Cranston for production, laboratory, pilot plant, and biological wastewater treatment facilities. In addition, Ciba-Geigy has 27.5 acres in Warwick which were utilized for cafeteria, locker room, storage, engineering, and maintenance facilities.

The Cranston plant was a batch process multi-product, fine organic chemical and pharmaceutical manufacturing operation using approximately 500 raw materials to produce nearly 150 finished products and numerous intermediate products. These products were manufactured on a batch basis, utilizing common equipment. Typical operations included organic synthesis, crystallization, distillation, isolation by filtration, drying, and grinding. The facility closed down operations and began to dismantle the operation last spring. As of May 1987, all chemical wastes stored onsite had been removed from the closed plant.

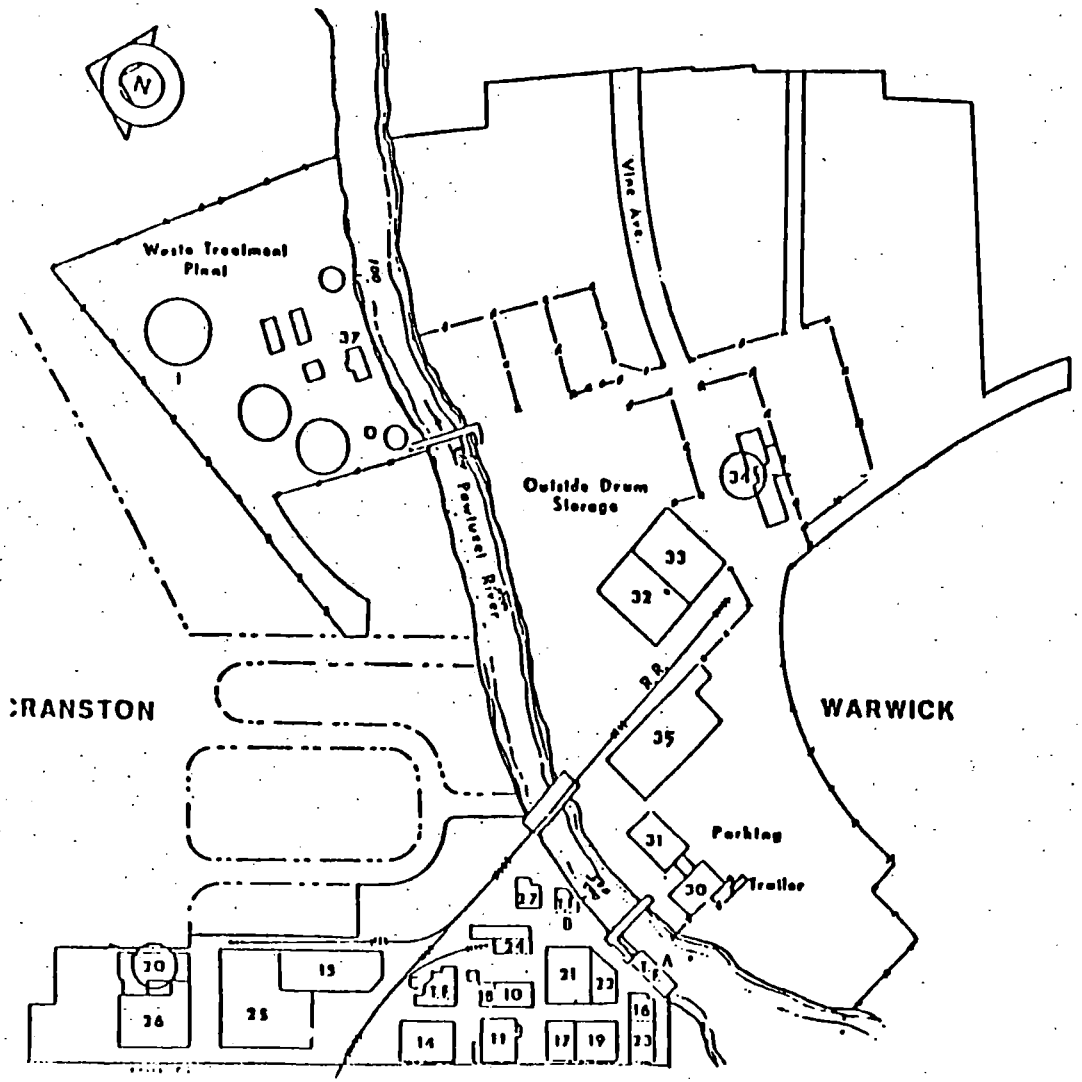
(CONTINUED)

SURROUNDING POPULATION: (X) Residential (X) Industrial ( ) Rural ( ) Urban OTHER:

SITE DESCRIPTION AND FEATURES: (CONTINUED)

During the SV, Versar expects that most of the facility buildings will have been demolished. Previously identified process areas and solid waste management units were located and examined during the visual site inspection conducted on May 8, 1987. Sampling activities will be restricted to areas of the facility where data gaps regarding releases from the site remain. The SV will be conducted with the EPA primary contact and a Ciba-Geigy representative. Split samples will be provided to Ciba-Geigy upon request. Exposure to chemicals and wastes prevuously onsite is expected to be minimal during these activities.

Principle exposure pathways during sampling acitivites include inhalation and/or contact with contamianted sample material. Activities performed under this health and safety plan will be limited to collecting soil/sediment and ground-water samples. Potential exposure hazards resulting from sampling activities will further be minimized by Versar personnel in the field by following standard operating procedures outlined in the SV work plan and this health and safety plan.



LEGEND

Bldg No.	
10	Steam Plant
11	Manufacturing
14	Office
15	Warehouse
16	Pilot Plant
17	Drying, Grinding, Blending
18	Electrical
19	Manufacturing
20	Laboratory
21	Manufacturing
22	Manufacturing, Grinding & Blendi.
23	Pilot Plant
24	Zinc Recovery System
25	Warehouse
26	Laboratory
27	Cooling Tower
30	Locker Room
31	Cafeteria
32	Warehouse (Temporary)
33	Maintenance
34	Engineering & Employee Relations
35	Maintenance Dept
37	Waste Treatment Facility
40) 41)	See map next page

T.F. Tank Farm

Cranston	
Bellefont Area (next page)	22.4 acres
Manufacturing	6.8 acres
Waste Treatment Facility	5.4 acres
	33.6 acres
Warwick	12.3 acres
Total Acreage	45.9 acres

SITE HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

From 1930 to 1949 the Alrose Chemical Co. occupied part of the present plant site now known as Ciba-Geigy. In 1949, Geigy Chemical Corporation purchased the land from Alrose Chemical and operated the facility as the new chemical manufacturing headquarters for all Geigy chemicals. In October 1971, Geigy Chemical merged with Ciba Corporation to form Ciba-Geigy Corporation, a subsidiary of Ciba-Geigy Ltd., Basel, Switzerland. In January 1984, Ciba-Geigy announced plans for a gradual phaseout of the Cranston plant as part of an overall consolidation of Ciba-Geigy's chemical manufacturing operations. As of May 1986 all chemical manufacturing operations at the site had ceased and dismatling of the facility begun.

During manufacturing operations Ciba-Geigy was frequently in violation of RIDEM air emission standards and received a multitude of odor complaints from surrounding communities throughout the years. Ciba-Geigy also subjected the Pawtuxet River to unpermitted discharge of raw wastes and process wastewater during periods of operational problems. No signifcant human exposures to releases from the facility have been documented or verified in the past. Odor complaints have ceased since the facility closed operations. U.S. EPA Region I, under the RCRA Corrective Action Program and as part of the TES III Contract has asked Versar to conduct an RFA of the Ciba-Geigy facility to identify potential or actual release from the facility and provide recommendations for further investigation.

WASTE TYPES: (X) Liquid ( ) Solid (X) Sludge ( ) Gas ( ) Unknown ( ) Other, specify:

WASTE CHARACTERISTICS: Check as many as applicable.

(X) Corrosive	(X) Flammable	( ) Radioactive
(X) Toxic	(X) Volatile	( ) Unknown
(X) Inert	(X) Reactive	( ) Other, specify:

HAZARDS OF CONCERN:

( ) Heat Stress attach guidelines	( ) Noise
( ) Cold Stress attach guidelines	(X) Inorganic Chemicals
( ) Explosion/Flammable	(X) Organic Chemicals
( ) Oxygen Deficient	( ) Other, specify:
( ) Radiological	
( ) Biological	

PRINCIPAL DISPOSAL METHODS AND PRACTICES: Summarize below.
Since Geigy Chemical Corporation operated the site from 1949, there reportedly has been no disposal of any waste from chemical manufacturing on the plant site. Most waste streams from process operations, classified as hazardous waste, were listed chlorinated and unchlorinated solvents, unlisted ignitable solvents, corrosive materials, and other chemicals. Ciba-Geigy stored hazardous wastes in 55-gallon drums and in a 6,000-gallon steel tank prior to shipment offsite for disposal or treatment. The facility shipped over four million pounds of hazardous waste each year mostly by 10,000-gallon railroad tank cars to hazardous waste disposal facilities. The drum storage area with an asphalt base, concrete curbs, and completely endorsed by chain link fence, had a capacity for 768 fifty-five gallon drums of hazardous waste. The maximum expected inventory of wastes in storage at any given time during the operating life of Ciba-Geigy's Cranston plant was 48,200 gallons.

HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category.

CHEMICALS: Amount/Units:	SOLIDS: Amount/Units:	SLUDGES: Amount/Units:	SOLVENTS: Amount/Units:	OILS: Amount/Units:	OTHER: Amount/Units:
(Acids)	Flyash	Paint Pigments	(Halogenated Solvents)	Oily Wastes	Laboratory Pharmaceutical
Pickling Liquors	(Asbestos)	Metals Sludges	(Non-Halogenated Solvents)	Other, Specify:	Hospital
Caustics	Milling/Mine Tailings	POTW	Other, Specify:		Radiological
(Pesticides)	Ferrous Smelter	Aluminum			Municipal
Dyes/Inks	Non-Ferrous Smelter	Other, Specify:			Other, Specify:
Cyanides	Other, Specify:				
(Phenols)					
Halogens					
(PCBs)					
(Metals)					
Other, Specify:					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (X) Low ( ) Unknown

JUSTIFICATION: Facility ceased chemical manufacturing operations in spring 1986 and is in the process of closing and cleaning up the site. All wastes managed and stored at the facility have been removed from the site. Threat of exposure to residual contamination which may be present is expected to be minimal. The types of chemicals used and wastes generated by the facility are known.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (X) Low ( ) Unknown

BACKGROUND REVIEW: (X) Complete ( ) Incomplete

KNOWN SITE CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (Specify units and media)	PEL/TLV ppm or mg/m^3 (Specify)	IDLH ppm or mg/m^3 (Specify)	SYMPTOM/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
Acetone	SL: 37 ppb	PEL: 1,000 ppm TLV: 750 ppm	20,000 ppm	Irritation of eyes, nose, and throat, headache, dizziness	N/A
Toluene	SL: 8.6 ppm A: 18.2 ppb S: 2 ppm SW: 46 ppm	PEL: 200 ppm TLV: 100 ppm	2,000 ppm	Fatique, weakness, confusion, headache, dizziness, insomnia	8.82
Tetrachloro-ethylene	N/A	PEL: 100 ppm TLV: 50 ppm	500 ppm	Irriation of eyes, nose, and throat, nausea vertigo, flushed face, headache	9.32
PAHS (Coal tar) volatiles)	S: 14,000 ppb SL: 44 ppb	PEL: 0.2 mg/m^3 TLV: 0.2 mg/m^3	400 mg/m^3	Dermatitis, bronchitis	N/A
Naphthalene	SL: 97 ppb	PEL: 10 ppm TLV: 10 ppm	500 ppm	Eye irritation, headache, confusion, nausea, abdominal pain, profuse sweating	8.12
Trichloroethylene	A: 0.35 ppb SW: 22 ppb	PEL: 100 ppm TLV: 50 ppm	1,000 ppm	Headache, vertigo, visual disturbance, nausea, vomiting, dermatitis	9.45
Phenol	SW: 1.2 ppm	PEL: 5 ppm TLV: 5 ppm	100 ppm	Irritation of eyes, nose, and throat, weakness, muscle ache, dark urine, skin burn, tremors	8.50

(Continued)

NA = Not Available NE = None Established U = Unknown

S = Soil SW = Surface Water T = Tailings F = Flyash TK = Tanks
A = Air GW = Ground water SL = Sludge D = Drums L = Lagoon

KNOWN SITE CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (Specify units and media)	PEL/TLV ppm or mg/m^3 (Specify)	IDLH ppm or mg/m^3 (Specify)	SYMPTOM/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
Chloroform	SL: 2.2 ppb	PEL: 50 ppm TLV: 10 ppm	1,000 ppm	Dizziness, nausea, headache, eye and skin irritation	11.12
Cadmium	SL: 413 ppb SW: 31 ppb	PEL: 0.2 mg/m^3 TLV: 0.05 mg/m^3	40 mg/m^3	Pulmonary edema, cough, headache, chills, muscle ache, nausea	NE
Lead	SL: 15.6 ppm SW: 55 ppb	PEL: 0.05 mg/m^3 TLV: 0.15 mg/m^3	Variable	Lassitude, pallor, constipation, abdominal pain, insomnia	NE
Xylene	SL: 180 ppb SW: 203 ppm	PEL: 100 ppm TLV: 100 ppm	10,000 ppm	Dizziness, excitement, drowsiness, irritated eyes, nose, and throat, nausea	8.56
Isopropanol	A: 40.4 ppb	PEL: 400 ppm TLV: 400 ppm	20,000 ppm	Mild irritation of eyes, nose and throat, drowsiness, dizziness, headache, cramps	N/A

FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE/SITE LOCATION	TYPE	LEVEL OF PROTECTION Primary	Contingency	SCHEDULE
1 Collect surface soil and subsurface soil samples following procedures outlined in SV work plan	(Intrusive) Non-intrusive	A B C (D) Modified	A B (C) D Site Exit	Week of June 8, 1987
2 Collect ground-water samples from ground-water level measurement pipes following procedures outlined in SV work plan	(Intrusive) Non-intrusive	A B (C) D Modified	A B C (D) Modified	Week of June 8, 1987
3 Collect river sediment samples from the Pawtuxet River using Ekman dredge or sediment sampler	(Intrusive) Non-intrusive	A B C (D) Modified	A B (C) D Modified	Week of June 8, 1987
4	Intrusive Non-intrusive	A B C D Modified	A B C D Modified	

SITE PERSONNEL AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	CDM HEALTH CLEARANCE	RESPONSIBILITIES	
Dennis Giustra	Versar Inc.	BS	WORK ASSIGNMENT MANAGER/ Site Health and Safety Coordinator	(1)-(2)-(3)- 4
Dave Dolak	Versar Inc.	BS	Monitoring Specialist	(1)-(2)-(3)- 4
Frank Battaglia	EPA Region I		Primary Contact	
James Crowley	Ciba-Geigy		Facility Contact	

PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material, as necessary.

BLOCK A

TASKS: 1-2-3-4
LEVEL: A - B - C - D - Modified
(X) Primary (X) Contingency

Respiratory: (X) Not needed

( ) SCBA, Airline:_____
( ) APR:_____
( ) Cartridge:_____
( ) Escape Mask:_____
( ) Other:_____

Head and Eye: ( ) Not needed

(X) Safety Glasses:_____
( ) Face Shield:_____
(X) Goggles:_____
(X) Hard Hat:_____
( ) Other:_____

Boots: ( ) Not needed

Boots: Safety/steel toe
Overboots:_____

Prot. Clothing ( ) Not needed

( ) Encapsulating Suit:_____
( ) Splash Suit:_____
( ) Apron:_____
( ) Tyvek Coverall
( ) Saranex Coverall
(X) Coverall: Cotton
( ) Other:_____

Gloves: ( ) Not needed

(X) Undergloves:_____
( ) Gloves:_____
( ) Overgloves:_____

Other: Specify below

BLOCK B

TASKS: 1-2-3-4
LEVEL: A - B - C - D - Modified
(X) Primary (X) Contingency

Respiratory: ( ) Not needed

( ) SCBA, Airline:_____
(X) APR: MSA full-face
(X) Cartridge: OV/particulate
( ) Escape Mask:_____
( ) Other:_____

Head and Eye: ( ) Not needed

( ) Safety Glasses:_____
( ) Face Shield:_____
( ) Goggles:_____
(X) Hard Hat:_____
( ) Other:_____

Boots: ( ) Not needed

Boots: Safety/steel toe
Overboots: Butyl

Prot. Clothing ( ) Not needed

( ) Encapsulating Suit:_____
( ) Splash Suit:_____
( ) Apron:_____
(X) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall:_____
( ) Other:_____

Gloves: ( ) Not needed

(X) Undergloves: PVC
(X) Gloves:_____
( ) Overgloves:_____

Other: Specify below

BLOCK C

TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary ( ) Contingency

Respiratory: ( ) Not needed

( ) SCBA, Airline:_____
( ) APR:_____
( ) Cartridge:_____
( ) Escape Mask:_____
( ) Other:_____

Head and Eye: ( ) Not needed

( ) Safety Glasses:_____
( ) Face Shield:_____
( ) Goggles:_____
( ) Hard Hat:_____
( ) Other:_____

Boots: ( ) Not needed

Boots:_____
Overboots:_____

Prot. Clothing ( ) Not needed

( ) Encapsulating Suit:_____
( ) Splash Suit:_____
( ) Apron:_____
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall:_____
( ) Other:_____

Gloves: ( ) Not needed

( ) Undergloves:_____
( ) Gloves:_____
( ) Overgloves:_____

Other: Specify below

BLOCK D

TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary ( ) Contingency

Respiratory: ( ) Not needed

( ) SCBA, Airline:_____
( ) APR:_____
( ) Cartridge:_____
( ) Escape Mask:_____
( ) Other:_____

Head and Eye: ( ) Not needed

( ) Safety Glasses:_____
( ) Face Shield:_____
( ) Goggles:_____
( ) Hard Hat:_____
( ) Other:_____

Boots: ( ) Not needed

Boots:_____
Overboots:_____

Prot. Clothing ( ) Not needed

( ) Encapsulating Suit:_____
( ) Splash Suit:_____
( ) Apron:_____
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall:_____
( ) Other:_____

Gloves: ( ) Not needed

( ) Undergloves:_____
( ) Gloves:_____
( ) Overgloves:_____

Other: Specify below

MONITORING EQUIPMENT: Specify by task. Indicate type, as necessary. Attach additional sheets, as necessary.

INSTRUMENT	TASKS	ACTION GUIDELINES	COMMENTS
Combustible Gas Indicator	1 - 2 - 3 - 4	0 - 10% LEL No explosion hazard. 10 - 25% LEL Potential explosion hazard; notify SHSC. >25% LEL Explosion hazard; interrupt task/evacuate. 21.0% O_2 Oxygen normal. <21.0% O_2 Oxygen deficient; notify SHSC. <19.5% O_2 Interrupt task/evacuate.	(X) Not needed
Radiation Survey Meter	1 - 2 - 3 - 4	3 x Background: Notify SHSC. > 2 mrem/hr: Interrupt task/evacuate	Note: Annual Exposure not to exceed 100 mrem/yr, or 50 urem/hr average (X) Not needed
Photoionization Detector ( ) 11.7 ev (X) 10.2 ev (.) 09.8 ev ( ) __ ev Type HNu or Photovac TIP	(1)-(2)-(3)- 4	Specify: Background ppm - Level D with routine monitoring 0 - 5 ppm - Proceed in Level C with constant monitoring >5 ppm - Exit from site area. Obtain guidance from EPA or TES III HSM on site re-entry. These guidelines are intended only for use by fully trained and qualified Versar personnel.	( ) Not needed It is not expected that action levels will be encountered. Previous air monitoring conducted by Versar around former process areas, production facilities, and open ground-water pipes during site visit on May 8, 1987, did not reveal levels above background in the breathing zone. All readings against which to base entry decisions will be taken from the breathing zone.
Flame Ionization Detector Type _____	1 - 2 - 3 - 4	Specify:	(X) Not needed
Detector Tubes/ Monitor Type _____ Type _____	1 - 2 - 3 - 4	Specify:	(X) Not needed
Respirable Dust Monitor Type _____ Type _____	1 - 2 - 3 - 4	Specify:	(X) Not needed
Other, Specify:	1 - 2 - 3 - 4	Specify:	

DECONTAMINATION PROCEDURES

ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES

Personnel Decontamination Summarize below and/or attach diagram	Sampling Equipment Decontamination Summarize below and/or attach diagram	Heavy Equipment Decontamination Summarize below and/or attach diagram
Formal decontamination will not be required between each sampling location or exit from the site. The extent of decontamination needed to prevent personal exposure and preserve the integrity of the samples collected will be determined in the field by fully trained Versar personnel. ( ) Not needed	Procedures are outlined in the SV work plan and repreated on Page 9a of this health and safety plan. The procedures described will be utilized for sampling equipment which may be reused during the sampling activities. Most sampling equipment will be dedicated and field decontaminated to the extent necessary for shipment back to Versar for complete decontamination. Monitoring equipment/ instruments will not require formal decontamination while in use onsite. ( ) Not needed	(X) Not needed
Containment and Disposal Method All disposable personnel protective equipment will be containerized and disposed of onsite if Ciba-Geigy has the capacity for disposal. Otherwise, items will be transported back to Versar for proper disposal.	Containment and Disposal Method All nonexpendable sampling equipment will be containerized and returned to Versar. Disposable items will be containerized and disposed of onsite if Ciba-Geigy has the capacity for disposal. Otherwise, items will be transported back to Versar for proper disposal.	Containment and Disposal Method

DECONTAMINATION PROCEDURES (CONTINUED)

1. Brush to remove visible particulates
2. Initial wash with decontamination solution
3. Rinse with tap water
4. Field strip equipment according to the manufacturer's instructions
5. Wash with decontamination solution
6. Rinse with tap water
7. Finse with pesticide-grade hexane/Level C protection should be utilized during this step
8. Rinse with deionized water
9. Air dry in dust free environment

Notes:

1. Decontamination solution will be of a nonphosphate type
2. All wash water will be contianed and disposed of later
3. Persons performing decontamination will wear gloves of a type suitable for the level of hazard.

EMERGENCY CONTACTS

Site Water Supply	
Site Telephone	401-467-8200
Site Radio	
Site Other (Specify) Ciba-Geigy, Hawthorne, NY	800-431-1900
USEPA Environmental Response Team	202-321-6660
US Coast Guard Environmental Response Team	800-424-8802
Association of American Railroads Response Team	202-293-4048
CHEMTREC	800-424-9300

CONTINGENCY PLANS Summarize below

Tasks 1, 2, and 3 - The SV will primarily be conducted utilizing Level D personnel protection. If conditions at a particular area of the site warrant a protection level upgrade, Level C contingencies will be available. If further protection level upgrade is required, the SV will be stopped and the area exited. Further guidance will be obtained from EPA primary contact onsite, and TES III HSM. Emergency exit routes from the facility will be determined prior to site entry.

Task 2 - Ground-water pipe locations will be approached from upwind upwind using Level C protection. Contaminants of concern are known onsite. No releases to the ground water have been documented at the site. If further justified, based upon instrument readings, sampling activities under this task may be conducted using Level D protection. Pipe caps will be opened prior to operations. Organic vapor readings at the pipe head will be taken immediately upon opening. After pipe has vented for at least 10 minutes, readings will again be taken at the pipe head and in the breathing zone. Levels encountered will be used to determine the level of protection for sampling. Level C will be maintained or downgraded accordingly. During sampling, constant monitoring of the breathing zone will be required.

SITE HEALTH AND SAFETY PLAN APPROVALS

RHSS Signature _____ Date _____

HSM Signature _____ Date _____

EMERGENCY CONTACTS	NAME	PHONE
CDM 24-Hour Emergency Line	N/A	202-896-4138
TES III Health and Safety Manager	M. Mathamel	703-642-0544
Regional Health and Safety Supervisor	CDM FPC Region I	617-439-3176
Project/Site Manager		
Site Health and Safety Coordinator	J. Crowley (C-G)	401-467-8200
EPA Contact	F. Battlaglia	617-223-1961
Other (specify)	R. Murphy (Versar)	703-750-3000
State Environmental Agency	RI DEM	401-277-2797
State Spill Contractor		
Fire Department	Cranston, RI	401-461-5000
Police Department	Cranston, RI	401-942-2211
State Police		
Health Department	Providence, RI	401-277-2000
Poison Control Center	Providence, RI	401-277-5727

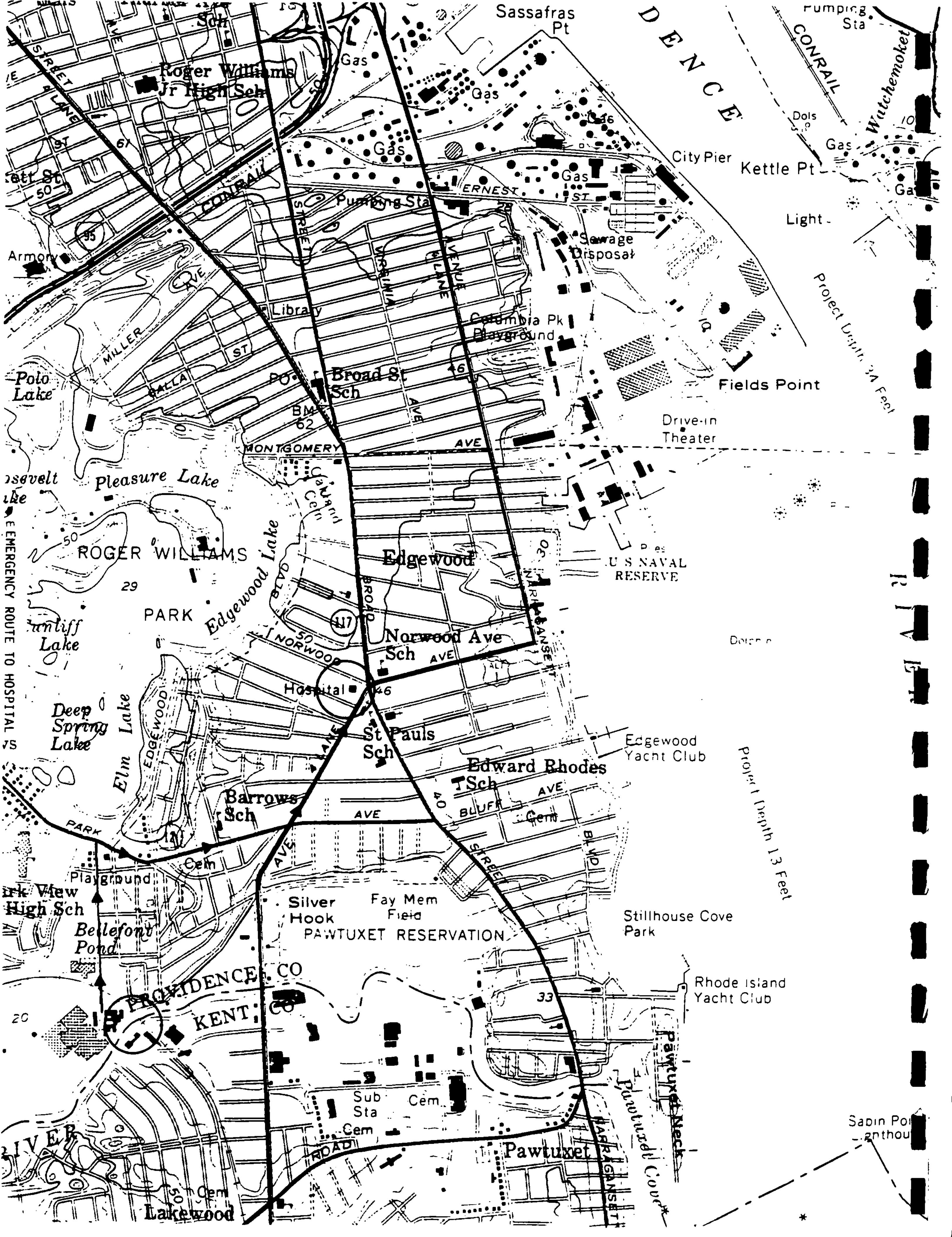
MEDICAL EMERGENCY Phone: 401-461-5000

Hospital Name: Cranston General
Hospital Address: 1763 Broad Street, Cranston, RI
Name of Contact at Hospital: Emergency Room Phone: 401-781-9200
Name of 24-Hour Ambulance: Fire Dept. Rescue
Route to Hospital:

Take Mill Street north to Park Avenue. Follow Park Avenue east to Warwick Avenue. Travel on Warwick Avenue north to intersection with Broad Street. Hospital is on the left.

Distance to Hospital Approximately 1-2 miles

Attach map with route to hospital



Sassafras Pt
Pumping Sta
CONRAIL
Watchemoket
Roger Williams Jr High Sch
Gas
Dols
Gas
City Pier
Kettle Pt
ERNEST ST
Pumping Sta
Sewage Disposal
Light
Armory
Library
VIRGINIA LANE
AVENUE
Columbia Pk Playground
Fields Point
MILLER AVE
GALLA ST
Polo Lake
Broad St Sch
BM 62
Drive-in Theater
MONTGOMERY AVE
Pleasure Lake
Oakland Cem
ROGER WILLIAMS PARK
Edgewood
U S NAVAL RESERVE
Edgewood Lake
BROAD
NARRAGANSETT
Norwood Ave Sch
NORWOOD AVE
Hospital
Deep Spring Lake
Elm Lake
St Pauls Sch
Edgewood Yacht Club
Edward Rhodes Sch
BLUFF AVE
Barrows Sch
PARK
Cem
Playground
Silver Hook
Fay Mem Field
PAWTUXET RESERVATION
Stillhouse Cove Park
Project Depth 13 Feet
Bellefont Pond
PROVIDENCE CO
KENT CO
Rhode Island Yacht Club
Pawtuxet Neck
Sub Sta
Cem
Pawtuxet Cove
Pawtuxet
ROAD
Lakewood
RIVER
EMERGENCY ROUTE TO HOSPITALS

The following personnel have read and fully understand the contents of this Health and Safety Plan and further agree to all requirements contained herein.

Name	Affiliation	Date	Signature
Dennis P. Giustra	Versar Inc.	5/29/87	Dennis P. Giustra